

What is claimed is:

1. A system for locating a transceiver in an enclosed location, comprising:
  - (i) a transceiver in an enclosed location operable to receive signals wirelessly, for measuring times-of-arrival of first-to-arrive signals or time-differences-of-arrival of first-to-arrive-signals, and for measuring angles-of-transmission for first-to-arrive signals from two or more transmitters, wherein such signals are the only ones with the potential to be line-of-sight signals, and also for measuring angles-of-transmission for any other arriving signals reflected by any reflecting surfaces in the enclosed location and to transmit the measurements by wireless means;
  - (ii) two or more revolving wireless transmitters situated outside the enclosed location operable to generate and transmit a synthetic Doppler; and
  - (iii) a processing centre operable to receive signals wirelessly from the transceiver and to compute and compare a line-of-position from time-of-arrival or time-difference-of-arrival data from the first-to-arrive signal from each transmitter with the angles-of-transmission and to determine the location of the transceiver as the intersection of the line-of-position with the intersection of the angles-of-transmission, if the line-of-position intersects with the intersection of the angles-of-transmission, or if no such intersection occurs, to determine the location of the transceiver through an iterative trial and error process that employs the correct angles-of-transmission, knowledge of the location of reflecting surfaces situated within the enclosed location and time-of-arrival or time-difference-of-arrival data assuming various angles of reflection to account for reflecting surfaces, until the times-of-arrival or time-differences-of-arrival calculated using this method are the same as the times-of-arrival or time-differences-of-arrival calculated from the signals detected by the transceiver.

2. The system of claim 1, wherein each of the two or more transmitters generates signals comprised of an electromagnetic carrier wave modulated by a short spreading code.
3. The system of claim 2, wherein the processing centre computes a line-of-position for the transceiver from the time-of-arrival or time-difference-of-arrival of the first-to-arrive signals at the transceiver from each of the two or more transmitters as computed from the phase difference of the start of the short spreading code sequence, also known as the code epoch, of the two or more signals detected by the transceiver.
4. The system of claim 3, wherein the transmitters establish a reference direction through the definition of a relationship between the code epoch and the reference Doppler shift, and the angle-of-transmission of each transmitter is computed from the phase difference between the code epoch and the reference Doppler detected by the transceiver for each transmitter.
5. The system of claim 3, wherein, if the direction of the transceiver contains a vertical component, the processing centre computes the vertical component directly based on the reduction of the Doppler shift by the cosine of the elevation.
6. The system of claim 3, where the axis of revolution of a transmitter is rotated in a horizontal direction and the processing centre computes the elevation of the transceiver using the corresponding time-difference-of occurrence of the code epoch and reference Doppler shift.
7. The system of claim 3, wherein the two or more transmitters situated at known locations outside the enclosed location are revolved about a horizontal circle at a periodic rate that is integrally related to the spreading code duration while each

transmitter radiates the modulated signal in order to achieve the synthetic Doppler.

8. The system of claim 4, wherein the two or more transmitters situated at known locations outside the enclosed location are revolved about a horizontal circle at a periodic rate that is integrally related to the spreading code duration while each transmitter radiates the modulated signal in order to achieve the synthetic Doppler.
9. The system of claim 5, wherein the two or more transmitters situated at known locations outside the enclosed location are revolved about a horizontal circle at a periodic rate that is integrally related to the spreading code duration while each transmitter radiates the modulated signal in order to achieve the synthetic Doppler.
10. The system of claim 3, wherein the transmitter is virtually revolved by sequentially switching the transmitted signal in turn to each of at least three identical antennas arranged in a circle, instead of revolving the transmitter itself in order to realize the Doppler shift.
11. The system of claim 4, wherein the transmitter is virtually revolved by sequentially switching the transmitted signal in turn to each of at least three identical antennas arranged in a circle, instead of revolving the transmitter itself in order to realize the Doppler shift.
12. The system of claim 5, wherein the transmitter is virtually revolved by sequentially switching the transmitted signal in turn to each of at least three identical antennas arranged in a circle, instead of revolving the transmitter itself in order to realize the Doppler shift.

13. The system of claim 1, wherein the enclosed location is the inside of a building.
14. A method of locating a transceiver in an enclosed location comprising:
  - (i) receiving wirelessly and measuring, via the transceiver, times-of-arrival or time-differences-of-arrival of first-to-arrive signals originating from each of two or more revolving wireless transmitters generating and transmitting a synthetic Doppler situated outside the enclosed location and relaying those measurements wirelessly to a processing centre via the transceiver;
  - (ii) determining, via the transceiver, angles-of-transmission of the transmitters for first-to-arrive signals from each transmitter, wherein such signals are the only ones with the potential to be line-of-sight signals, as well as angles-of-transmission for any other arriving signals reflected by any reflecting surfaces in the enclosed location and relaying those measurements to a processing centre via the transceiver;
  - (iii) computing and comparing, via the processing centre, a line-of-position from time-of-arrival or time-difference-of-arrival data from the first-to-arrive signal from each transmitter with the angles-of-transmission; and
  - (iv) determining the location of the transceiver as the intersection of the line-of-position with the intersection of the angles-of-transmission, if the line-of-position intersects with the intersection of the angles-of-transmission, or if no such intersection occurs, determining the location of the transceiver through an iterative trial and error process that employs the correct angles-of-transmission, knowledge of the location of reflecting surfaces situated within the enclosed location and time-of-arrival or time-difference-of-arrival data assuming various angles of reflection to account

for the positions of the known reflecting surfaces, until the times-of-arrival or time-differences-of-arrival calculated using this method are the same as the times-of-arrival or time-differences-of-arrival calculated from the signals detected by the transceiver.

15. The method of claim 14, wherein each signal originating from a transmitter is comprised of an electromagnetic carrier wave modulated by a short spreading code.

16. The method of claim 15, wherein the line-of-position is computed for the transceiver by the processing centre from the time-of-arrival or time-difference-of-arrival of the first-to-arrive signals at the transceiver from each of the two or more transmitters as computed from the code epoch of the two or more signals detected by the transceiver.

17. The method of claim 16, wherein a reference direction is established by the transmitters through the definition of a relationship between the code epoch and the reference Doppler shift, and the angle-of-transmission of each transmitter is computed from the phase difference between the code epoch and the reference Doppler detected by the transceiver for each transmitter.

18. The method of claim 17, wherein, if the direction of the transceiver contains a vertical component, the said vertical component is computed by the processing centre directly based on the reduction of the Doppler shift by the cosine of the elevation.

19. The method of claim 17, wherein the axis of revolution of the transmitter is rotated in a horizontal direction and the elevation of the transceiver is computed by the processing center using the corresponding time-difference-of occurrence of the code epoch and reference Doppler shift.

20. The method of claim 17, wherein the synthetic Doppler is achieved by revolving the two or more transmitters situated at known locations outside the enclosed location about a horizontal circle at a periodic rate that is integrally related to the spreading code duration while each transmitter radiates the modulated signal.

21. The method of claim 18, wherein the synthetic Doppler is achieved by revolving the two or more transmitters situated at known locations outside the enclosed location about a horizontal circle at a periodic rate that is integrally related to the spreading code duration while each transmitter radiates the modulated signal.

22. The method of claim 19, wherein the synthetic Doppler is achieved by revolving the two or more transmitters situated at known locations outside the enclosed location about a horizontal circle at a periodic rate that is integrally related to the spreading code duration while each transmitter radiates the modulated signal.

23. The method of claim 17, wherein the Doppler shift is realized by a virtually revolved transmitter by sequentially switching the transmitted signal in turn to each of at least three identical antennas arranged in a circle, instead of revolving the transmitter itself.

24. The method of claim 18, wherein the Doppler shift is realized by a virtually revolved transmitter by sequentially switching the transmitted signal in turn to each of at least three identical antennas arranged in a circle, instead of revolving the transmitter itself.

25. The method of claim 19, wherein the Doppler shift is realized by a virtually revolved transmitter by sequentially switching the transmitted signal in turn to each of at least three identical antennas arranged in a circle, instead of revolving the transmitter itself.

26. The method of claim 14, wherein the enclosed location is the inside of a building.